

What Is Claimed Is:

1. An automated transmission for a vehicle comprising a multi-ratio gear box connected to an engine by means of a transmission clutch, a transmission brake acting on a component of the transmission between the transmission clutch and the driven wheels of the vehicle, an electronic control unit, means for sensing actuation of the transmission brake and sending a signal indicative thereof to the control unit, means for sensing the engine torque and sending a signal indicative thereof to the control unit, means for sensing the vehicle speed and sending a signal indicative thereof to the control unit, means for sensing whether a gear downshift is requested or in operation and sending a signal indicative thereof to the control unit, and means for sensing whether an operating brake of the vehicle is applied and sending a signal indicative thereof to the control unit; characterized in that the control unit controls operation of the transmission brake to apply a braking torque to the transmission, if the engine torque is negative, the vehicle speed is above a predetermined value, a gear downshift has been requested or is in progress and the operational brakes of the vehicle are not applied.
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2. An automated transmission system according to Claim 1 wherein the transmission is operatively arranged such that when the transmission brake is applied, as the clutch is released, torque applied by the transmission brake replaces the loss of engine braking as the clutch is released.
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3. An automated transmission system according to Claim 1 wherein the transmission brake is operatively arranged to be applied to prevent the speed of the vehicle rising above a vehicle speed value attained when a gear downshift was initiated.
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4. An automated transmission system according to Claim 3 wherein the speed of the vehicle when a gear downshift is initiated is recorded by the control unit.
5. An automated transmission system according to Claim 3 wherein the transmission brake is operatively arranged to be released to permit the vehicle to accelerate to the value of the speed of the vehicle when a gear downshift was initiated, if the speed of the vehicle falls significantly below said value, during a gear downshift.
- 10 6. An automated transmission system according to Claim 1 wherein when the torque transmitted by the clutch is reduced to zero, the gear shift is completed, the engine speed is synchronized to the new gear and the clutch is re-engaged.
7. An automated transmission system according to Claim 6 wherein upon re-engagement of the clutch, the torque applied by the transmission brake is ramped down until the transmission brake torque is zero.
8. An automated transmission system according to Claim 7 wherein the transmission brake torque is ramped down to provide a smooth deceleration of the vehicle.
- 20 9. An automated transmission system according to Claim 8 wherein the transmission brake torque is ramped down as the clutch is re-engaged, and the decrease in torque applied by the transmission brake tracks the increase in torque transmitted by the clutch.

10. An automated transmission system according to Claim 8 wherein the torque applied by the transmission brake divided by the ratio of the gear engaged, minus the engine torque equals the actual torque transmitted by the clutch.
- 5 11. An automated transmission system according to Claim 3 wherein the transmission brake is operatively arranged to hold the vehicle when starting-up from rest on an incline.
- 10 12. An automated transmission system according to Claim 11 wherein the transmission brake is applied when the control unit requests selection of a take-up gear; the vehicle throttle sensor indicates that there is no throttle input; the vehicle speed sensor indicates that the vehicle speed is below a predetermined low limit; and brake sensors indicate that neither the operating brake nor parking brake are applied.
- 15 13. An automated transmission system according to Claim 12 wherein the torque applied by the transmission brake is increased at a rate which substantially matches the decrease in torque transmitted by the clutch, as the clutch is released to permit selection of the take-up gear.
- 20 14. An automated transmission system according to Claim 11 wherein upon selection of a take-up gear, the clutch is disengaged and the transmission brake is released.
15. An automated transmission system according to Claim 14 wherein the torque applied by the transmission brake is reduced so that the torque applied by the transmission

brake divided by the ratio of the gear engaged, minus the actual torque transmitted by the clutch equals a predetermined torque value.

16. An automated transmission system according to Claim 11 wherein the transmission
5 brake is released if the throttle is actuated, the take-up gear selection is aborted and/or if
the operational brake or parking brake are applied.
17. An automated transmission system according to Claim 11 wherein the torque applied
10 by the transmission brake is increased, if movement of the vehicle in the opposite
direction to that desired is detected.
18. An automated transmission system according to Claim 17 wherein movement of the
vehicle in the opposite direction to that desired is detected by means of a plurality of
15 vehicle speed sensors, the speed sensors each producing a pulsed signal, the frequency
of the pulses corresponding to the speed of the vehicle, the pattern of pulses produced
by the vehicle speed sensors on start-up of the vehicle being compared with the pattern
of pulses when the vehicle last came to rest.
19. An apparatus for detecting the direction of movement of a vehicle on starting from rest,
20 comprising: a plurality of vehicle speed sensors, said vehicle speed sensors each
producing a pulsed signal, the frequency of the pulses corresponding to the speed of the
vehicle, characterized in that the pulses of one sensor are out of phase with those of
another sensor by less than half the frequency of the pulses, the pattern of pulses
produced by the sensors at start-up of the vehicle being compared to the pattern of
25 pulses when the vehicle last came to rest.

20. The apparatus recited in Claim 19 wherein the vehicle speed sensors are associated with each of the wheels of the vehicle.
- 5 21. The apparatus recited in Claim 20 wherein two vehicle speed sensors are associated with a common component of a vehicle transmission system, the sensors being arranged to produce pulsed signals which are out of phase.

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